Resting Energy Expenditure And Delayed Onset Muscle Soreness After Full-Body Resistance Training With An Eccentric Contraction

Authors: K.J. Hackney, H.J. Engels, and R.J. Greterbeck (Note if many authors, state K.J. Hackney et al.)

Journal of Strength and Conditioning, 2013

Presented by Your Name
Introduction Slide(s)

- Introduce audience to what the study is investigating.

- Highlight background information/research provided by authors.

NOTE: Use Relevant Graphics

**What is Eccentric Exercise?**

- **Eccentric Contraction:**
  The elongation of a muscle during force production

- **Concentric Contraction:**
  The shortening of a muscle during force production
Resting Energy Expenditure (REE)

- REE accounts for ~60-75% total daily expenditure (Tarnopulosky, 2009)
- Eccentric muscle contraction may have a strong influence on magnitude and duration of increases in REE

Delayed-Onset Muscle Soreness (DOMS)

Caused by resistance training
Characterized by symptoms of mild discomfort or pain; especially when the muscle is stretched or palpated (Balneve, 2007)
Peaks between 24-72 hours
Purpose, Question or Problem of the Study

- What is the purpose(s), problem(s) being addressed. (What were the overall goals and specific aims of study?)
- Some journals have authors present a hypothesis (or possible outcome to the study). If so, state it.
- SPECIAL note: When you refer to the study say ‘the authors’ or ‘the researchers;’ NOT my study or our study

Purpose of Study

“To determine the effect of an acute bout of high-volume, full-body resistance training with eccentric contractions on REE and indicators of DOMS in RT and UT males.”
Authors’ Hypotheses

- Researchers hypothesized that REE and DOMS would be significantly higher in UT males.
- REE and DOMS would be significantly elevated beyond 48 hours in all participants.

Significance of Study

- Why is this study important. Usually stated in article. If not, you state from your interpretation.
Significance of Study

- Very little evidence exists about resting energy expenditure and DOMS.
- This study will contribute scientific knowledge and understanding about this unique physiological association.

Methods: Be Detailed

- How did authors conduct study?
- Describe subjects, tests, conditions, equipment, protocol, etc.
- Be specific (and succinct)
- Be careful of content overload.
- May need to focus on most important variables ONLY and exclude others!
Methods

- 16 male subjects were selected
- 8 untrained (UT) and 8 trained (RT)
- UT had no WT in last 6 months
- Resistance trained had minimum of 2 days/wk for 6 months

Methods Cont.

- Hydrostatic weighing was used to determine body density
- Brozek et al. equation was used for determine fat-free mass (FFM)
Methods Cont.

- 4-day dietary log (amount of food, food description, meal time)
- Nutritionist V was used to analyze intake

REE was measured by indirect calorimetry
- Tested 4 consecutive mornings
- 12 hour fast, ~8 hours sleep
- 20 minutes in dark place before test
Muscle soreness was rated by using a rating of perceived muscle soreness scale (RPMS).

- Average of two scores was used as the value.

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Resting venous blood samples were taken to measure creatine kinase levels.
Methods Cont.

Protocol:

- 1 full body workout session, ~ 1 hour
- 8 sets of 6 repetitions on 8 exercise machines
- 3 second eccentric, 1 second concentric
- Sets 1-3 were very light for familiarization in UT males

Resistance Training Protocol

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<tr>
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<th>Rotation 2</th>
<th>Rotation 3</th>
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<tbody>
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<td>Should Press</td>
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<td>Leg Extension</td>
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Methods Cont.

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<tr>
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<th>Day</th>
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<tbody>
<tr>
<td>Full Body Workout</td>
<td>Day 1</td>
</tr>
<tr>
<td>REE Measurement</td>
<td>Day 1-4</td>
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<tr>
<td>DOMS Markers</td>
<td>Day 1-4</td>
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<tr>
<td>Body Composition</td>
<td>Day 1</td>
</tr>
<tr>
<td>Dietary Log</td>
<td>Day 1-4</td>
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Results

- What are the results of the study? Use tables, charts, figures but SHOW results.
- **IMPORTANT:** Significant should only be stated if the result is statistically significant
- Always present the probability with stats; i.e., p<0.05, p<0.01; p>0.05, etc.
Results

- Resistance trained participants lifted approximately **22%** more than untrained participants.

Results Cont.

- Peak REE value was measured at 48 hours, and stayed elevated at 72 hours, in RT and UT groups.
- Average increase in REE in UT was 9.2% and 7.9% in RT.
Results Cont.

- Creatine kinase was elevated at 24 hours in RT, and 24, 48, and 72 hours in UT
- 3 UT participants with unusually high CK levels

Results Cont.

- RPMS elevated in RT at 24 and 48 hours
- RPMS elevated at 24, 48, and 72 hours in UT
Discussion

- Summarize authors discussion of results.
- What conclusions did authors reach?
- Do they support hypothesis?
- What do the authors consider significant about this study’s findings?
- How did the authors say the study compared to similar studies?

REE can be significantly (p<0.05) elevated for up to 72 hours post-exercise in both UT and RT males.

REE and DOMS was significantly (p<0.05) higher in UT males.
Authors’ Hypotheses Supported

- Researchers hypothesized that REE and DOMS would be significantly (p<0.05) higher in UT males: **Supported**
- REE and DOMS would be significantly (p<0.05) elevated beyond 48 hours in all participants: **Supported**

Discussion

- Athletes, weight-lifters and bodybuilders aiming for hypertrophy need a positive energy balance
- May require additional caloric intake on training days and the days following.
Discussion Cont.

- Weight loss attempts could benefit from the negative energy balance created by full-body eccentric exercise
- Approximately 9% increase in REE in UT

Discussion Cont.

- Protocol may cause extreme soreness in UT
- Proper form, inadvertently causes eccentric emphasis
Recommendations Slide

- Do the authors recommend any further investigations?
- If so what? Do you agree? Any suggestions you would like to add.

Please make this brief

Recommendations

The authors believe that more research is required to understand the biological mechanisms contributing to D.O.M.S.
Conclusion Slide

- Highlight main conclusions of study

In Conclusion...

- REE can be significantly (p<0.05) elevated for up to 72 hours post-exercise in both UT and RT males
- REE and DOMS was significantly (p<0.05) higher in UT males.
Questions?
Thank You

Class, Dark Color Slide Idea!
Keys to Analyzing Research

- Downsize methods/results of complex studies.
- Be an objective detective as you read!
- When reviewing the methods, make sure you note which of the following apply.
  - Gender, age and number of subjects
  - How subjects were matched or paired in groups or randomly selected (randomly assigned)
  - What controls were in place by researchers?
  - Was this a healthy, athletic or clinical group?
Caution of Content Overload!
Let’s Compare a few examples

Results Cont.

- There was a significant increase in total number of repetitions after ST in both males and females.
- The AC in men didn’t see a significant improvement in the number of repetitions performed.
- ST program increased the number of repetitions in all sets of the three exercises, decrease in performance between sets was unchanged.
ONE MORE tip!

- Do not need to STATE first name of researchers...Just last name or first initial and last name
- i.e., Kravitz et al or L. Kravitz et al
- Jacobs et al means Jacobs and others
Timeline/Deadline

- Your completed power point presentation is due to Dr. Kravitz by 12 midnight on Tuesday evening (the night before you present).
- NO NOTE CARDS!!!
- Your presentation is up to 12.5 min

YOU CAN DO THIS EXTREMELY WELL!

- GO FOR IT!